

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: <div style="text-align: center; margin-top: 40px;">see form PCT/ISA/220</div>		Date of mailing (day/month/year) see from PCT/ISA/210 (page 2)
Applicant's or agent's file reference see form PCT/ISA/220		FOR FURTHER ACTION See paragraph 2 below
International application No. PCT/EP2004/053004	International filing date (day/month/year) 11/18/2004	Priority date (day/month/year) 1/15/2003
International Patent Classification (IPC) or both national classification and IPC H01L41/083, H01L41/053		
Applicant ROBERT BOSCH GMBH		

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ European Patent Office Rijswijk	Authorized officer Köpf, C
Facsimile No.	Telephone No.

Form PCT/ISA/237 (cover sheet) (January 2004)
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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2004/053004

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/EP2004/053004

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-10	YES
	Claims		NO
Inventive step (IS)	Claims	1-10	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-10	YES
	Claims		NO

2. Citations and explanations:

see supplementary page

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/053004

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see supplementary page

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(SUPPLEMENTARY SHEET)

International file number PCT/EP2004/053004

Re Point V

1 Reference is made to the following documents:

- D1: EP 1 233 461 A (CERAM TEC AG) August 21, 2002
- D2: PATENT ABSTRACTS OF JAPAN vol. 1995, no. 09,
October 31, 1995 & JP 07 154005 A (TOKIN CORP)
June 16, 1995
- D3: DE 101 63 005 A1 (DENSO CORP) October 10, 2002
- D4: EP 0 144 655 A (NEC CORP) June 19, 1985
- D5: WO 03/026033 A (SIEMENS AG; FREUDENBERG HELLMUT
ET AL) March 27, 2003

2 Document D1 is regarded as the most proximate related art. It discloses (the notation in parentheses refers to this document; see paragraphs [0012]-[0015]; figures) an actuator (1) having piezoelectric ceramic layers (2) stacked to form a multilayer stack, an electrode layer (3) being provided between each of the ceramic layers, an outer cover layer (8, 9) being provided on each end face of the actuator and being made of the same material as the piezoelectric ceramic layers and being adjacent to a transitional area (11, 18) which may be made of ceramic material doped with the electrode metal (silver).

Document D2 (see abstract) discloses a similar actuator, the outer area of the cover layers (18A, 18B) being made of a ceramic material doped with the electrode metal (silver-palladium alloy).

The object of independent Claim 1 differs from that of documents D1 and/or D2 in that the outer cover layers

have a lower relative dielectric constant than the piezoelectric ceramic layers in between.

2.1 The object of Claim 1 is thus novel (Article 33(2) PCT).

The object to be achieved with the present invention may thus be regarded as reducing the electromagnetic interference caused by stray capacitance of the cover layers.

2.2 The approach proposed in Claim 1 of the present application to achieve this object is based on an inventive step for the following reasons (Article 33(3) PCT):

Documents D1 and D2 describe only metal doping of the cover layers to adapt the shrinkage behavior in sintering;

D3 and D4 describe cover layers made of the same material as the piezoelectric ceramic layers or made of another unspecified material (D4);

D3 also discloses solid impact elements made of aluminum oxide or silicon nitride for transferring force to the cover layers of the actuator;

Document D5 describes insulating layers (slabs) of an unspecified ceramic between the actuator and the housing covers.

Thus cover layers having a lower dielectric constant than the piezoelectric ceramic layers of the actuators are neither disclosed nor suggested in the related art. The problem of interfering capacitance is not discussed.

2.3 Claims 2 through 10 depend on Claim 1 and thus also meet the PCT requirements with respect to novelty and inventive step.

Re Point VII

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the document DE 198 38 862 A1 cited in the description does not disclose the relevant related art as indicated.